Cold Spring Harbor Perspectives in Medicine, 2016, vol.6, N2

GABAergic synchronization in epilepsy

Khazipov R.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 Cold Spring Harbor Laboratory Press; all rights reserved.γ-Aminobutyric acid (GABA) is the main inhibitory neurotransmitter in the cerebral cortex. GABAergic inhibition enables synchronization of activity in cortical networks, and contributes to generation of variety of brain activity patterns. In relation to epilepsy, GABAergic inhibition has been traditionally viewed as the main mechanism counterbalancing glutamatergic excitation and preventing hypersynchronous neuronal discharges. Indeed, deficits in GABAergic functions most commonly result in a hyperexcitable epileptic state, and many of the currently used antiepileptic drugs act through enhancement of GABAergic functions. However, a number of observations show that some epileptiform activity patterns involve synchronization by GABAergic mechanisms. These include two main categories that will be reviewed here: (1) synchronization of epileptiform oscillations based on GABAergic inhibition, and (2) epileptiform events driven by depolarizing and excitatory GABA. The conclusion is reached that GABAergic control of spike timing, either through inhibition or excitation under certain conditions, maywork as a powerful synchronizing mechanism during epilepsy.

http://dx.doi.org/10.1101/cshperspect.a022764